



Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

GEOGRAPHIC ASPECTS OF THE WAR

By DOUGLAS WILSON JOHNSON

Associate Professor of Physiography, Columbia University

Introduction. Every military campaign is controlled to some extent by the surface features of the country over which the contending armies must move. Both detailed movements of troops and general plans of campaign must be ordered with due regard to topography; and the geographer who reads the war dispatches with a good assortment of large-scale topographic maps before him will perceive many evidences of the rôle played by land forms in military operations.

It need hardly be explained that while the best maps show the topography with a high degree of accuracy, the official reports of troop positions are always very generalized and often purposely incorrect. Despite this limitation, the careful student can learn enough to justify a study of the war from the physiographic standpoint. The object of the present article is to present a picture of the surface upon which the western campaign has been conducted and to note incidentally some relations between topography and military movements.

I.—THE WESTERN THEATRE OF WAR

The geologic architecture of western Europe is the key to its salient topographic features. A broad area of folded and broken rocks was bevelled across by erosion, and upon the flat plain thus formed horizontal layers of clay, sandstone, chalk, and limestone were deposited. The whole mass was then warped upward around the edges so as to produce a gigantic saucer or basin, known to geographers as the "Paris Basin." From those parts of the basin's margin which were bent upward to the greatest heights erosion has removed the covering rock layers and exposed the underlying folded beds, which have in their turn been carved into mountain ridges and valleys. Among the marginal areas of uplifted and dissected older rocks are the Vosges Mountains on the east and the Ardennes on the north.

As the most important activities in the present war have thus far occurred in the northeastern portion of the basin just described, we may give our further attention exclusively to this area. The accompanying illustration shows a rectangular block of the earth's crust, which we may imagine as cut out and isolated for greater convenience of study. It represents the northeastern quadrant of the Paris Basin and some adjacent territory. Without making any pretension to accuracy, the diagram will serve to emphasize those elements of surface form essential to an understanding of the campaign against France and Belgium.

One readily observes, for example, that south of Paris the layers of sandstone and other stratified rocks are nearly horizontal, but that they slope upward very gently to the west and east to form the rims of the basin. It will be seen, also, that the underlying folded rocks come to the surface at the east, forming mountains from which the later beds have been completely eroded. Originally this eastern rim of the basin was a broad north-south arch, with a gently rounded summit; but a north-south block of rock extending along the crest, and

bounded by two parallel fractures, dropped down several thousand feet, giving the broad, flat-floored valley of the middle Rhine. The fertile plains of this valley floor constitute that part of the province of Alsace which the French are most anxious to recover from the Germans.

The two remaining limbs of the former arch, facing inward toward the down-dropped central strip, are known as the Vosges Mountains and the Black Forest. Each of these ranges has a gentle back slope away from the valley, and a steep face toward the valley representing the nearly vertical fracture surface now eroded into sharp crested ridges and narrow ravines. Both slopes of each range are sufficiently rugged to make agriculture difficult and the building of roads and railroads expensive; hence the ranges are but little developed, and much forested land remains. But it is on the steeper slopes which lead abruptly downward to the flat floor of the Rhine Valley that the ridges are most rugged

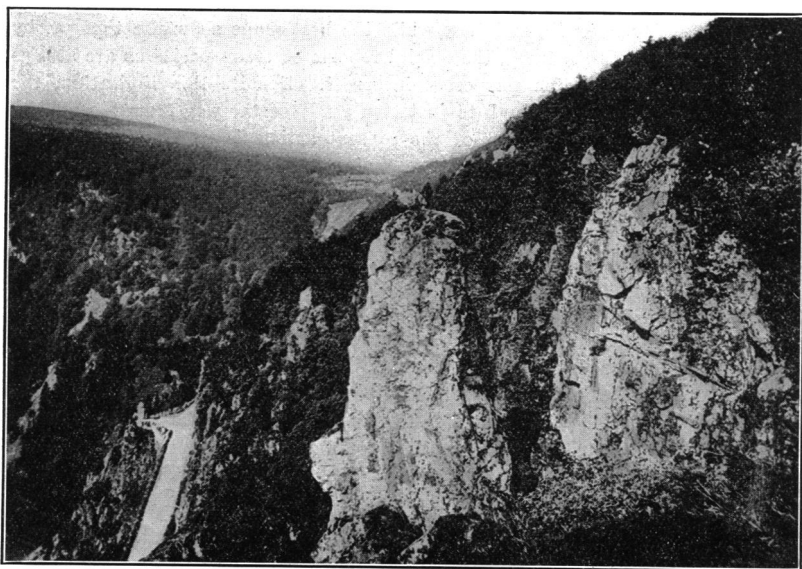


FIG. 2—Schlucht Pass across the crest of the Vosges Mountains, showing contrast between the gorges on steep eastern face (foreground), and the more open country of the gentle western slope (background).

and the forest most unbroken. Here the movement of large bodies of troops is particularly difficult, especially if they must ascend the slopes in the face of a determined enemy.

It was not political expediency alone which led the French to invade southern Alsace at the beginning of the war. The international boundary line follows the crest of the southern Vosges, and it was much easier for the French to move up the gentle west slope of the Vosges, capture the passes and then sweep down the steep eastern face upon the flat plains about Mülhausen than it was for them to cross the boundary farther northwest, where no such advantage was furnished by the topography. A French soldier, writing home from the battle line in the Vosges, described the influence of topography upon the fighting in that district

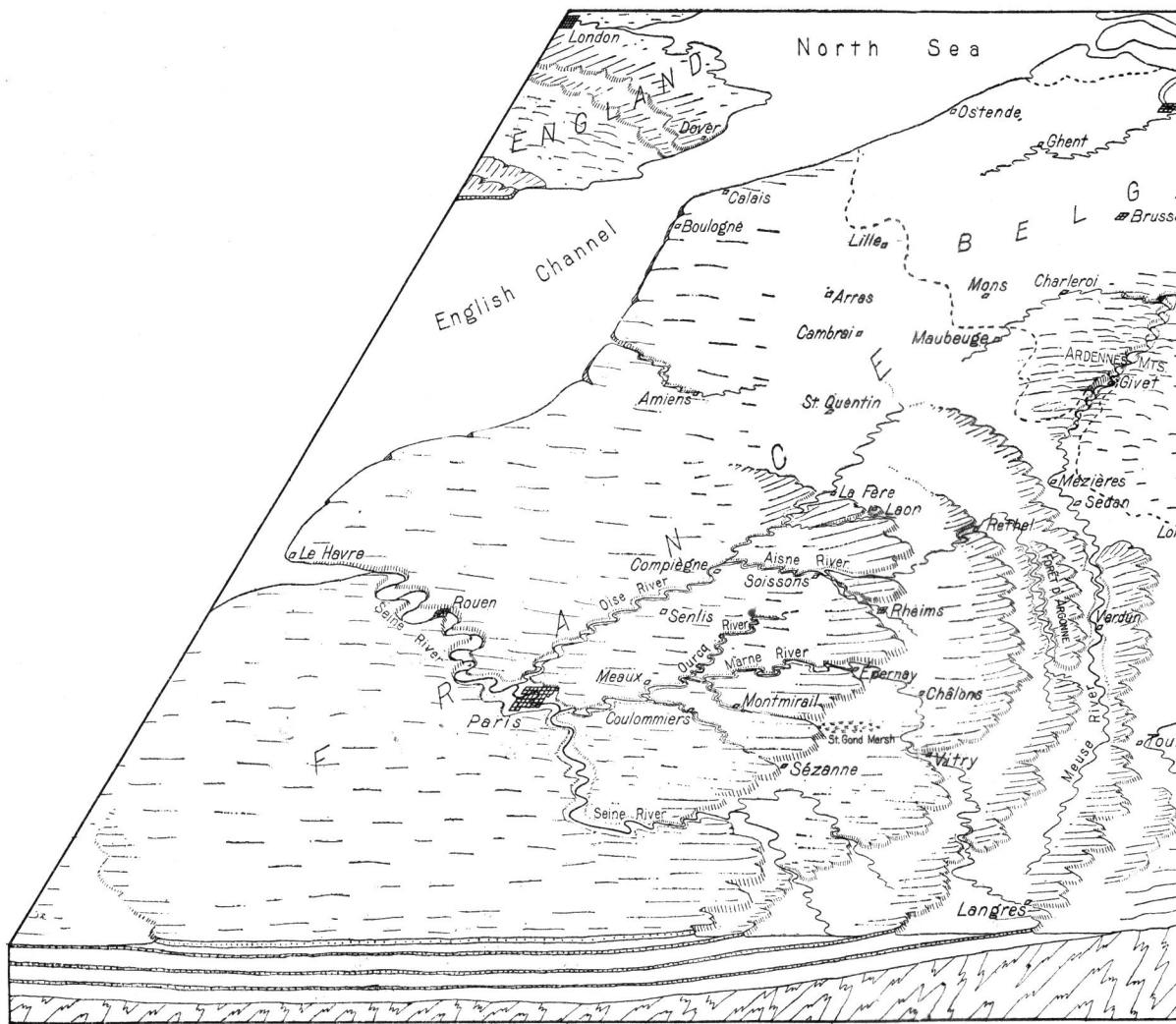


FIG. 1—Block diagram showing topographic features of west central Europe.

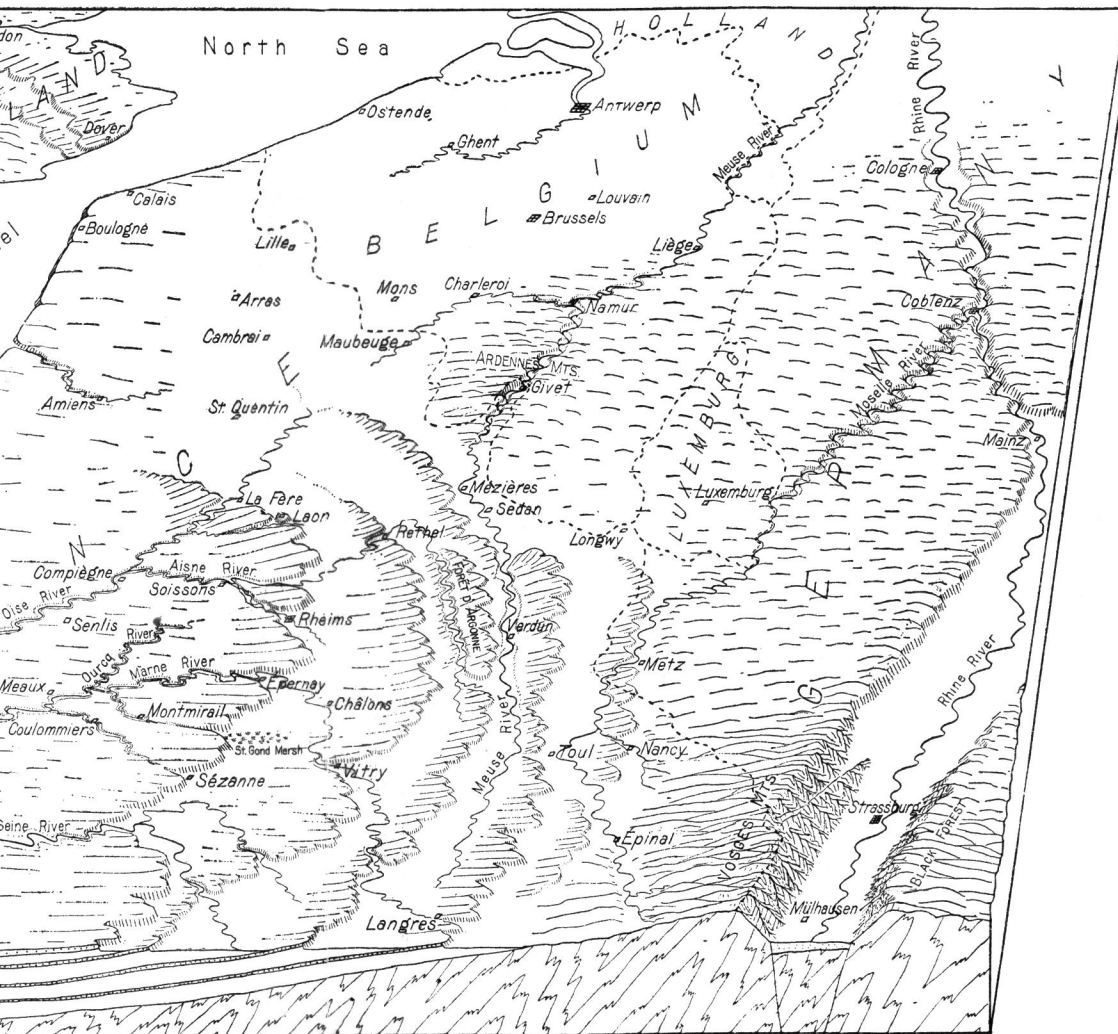


diagram showing topographic features of west central Europe.

in the following words: "Our task has been much easier in the southern Vosges than farther north. In the south it is all downhill after we cross the border; but in the north we must fight uphill against the Germans after we have entered their territory, as there the boundary line lies west of the mountain crest."

It is stated in press reports that a commander of German forces at Mülhausen, ordered to lead his men across the Vosges Mountains into France, made three futile attempts to carry the heights of the range in the face of French artillery. Then came an urgent message from the Kaiser: "The crest of the Vosges must be crossed at any cost." A fourth desperate assault by the intrepid commander ended in his defeat. Retiring to his quarters, the unhappy general committed suicide, first sending to his Kaiser this message: "The Vosges cannot be crossed. Come and try it yourself." I cannot vouch for the truth of this report; but it serves to illustrate the peculiar surface features of the Vosges which render their ascent comparatively easy from the French side of the border but very difficult from the German side.

In this connection it is interesting to note that should the French succeed in pushing the Germans back to the east side of the Rhine, their further eastward advance in southern Germany would then be opposed by precisely the same topographic difficulties which have long retarded the westward movement of the Germans in southern Alsace. The Black Forest will replace the Vosges in immediate importance, and while the Germans hold the crest and more gentle eastward slope of this range the French will find assaults against the steep west-facing scarp both costly and difficult.

Not far south of Mülhausen, but beyond the limits of the drawing, the Vosges Mountains descend to a low pass which connects the Rhine Valley with the valley of the Soane in eastern France. In this pass, guarding the strategic gateway from one valley to the other, stands the mighty fortress of Belfort, the southernmost of the great fortifications erected against a German invasion. Entrance to France by this route is easy, so far as the natural physical features alone are concerned; and in the commercial intercourse between the two nations the gateway has played an important rôle. But the opening is narrow enough to be effectively defended by the fortress in its center and to permit the concentration of troops in such numbers as to render its passage by an invader extremely difficult. Whether the fortress which withstood the attacks of the Germans in 1870 can defy the guns which reduced Liège, Namur, Maubeuge and Antwerp will be determined only in case the Germans can push the French field army back far enough to bring the Krupp guns within range of the walls of Belfort.

North and west of the Vosges Mountains the older series of folded rocks, exposed at the surface around the margin of the Paris Basin, have not been raised so high as in the Vosges. Instead they form an upland of but moderate elevation, which was once a nearly level erosion plane; but which, since the uplift, has been cut into hills and valleys by many branching streams. This hilly country is known as the Slate Mountains, the Haardt, the Eifel, and by other names in Germany, and as the Ardennes in southern Belgium. Although usually described as mountainous, the most striking feature of this area is the remarkably even sky-line which appears in every distant landscape view, and which is proof that the much folded rocks were once worn down to a surface of faint relief, after which warping raised the surface to its present position and permitted its dissection by river erosion. The upland is now so

badly cut up by streams that cross-country travel is difficult, and transportation lines tend to follow the valleys.

Two main rivers cut across this upland toward the northeast—the Moselle and the Meuse; while the lower Rhine transects it from southeast to northwest. Evidently two armies with headquarters at Coblenz and Cologne, and supplied by the railways, auto roads and steamer routes which pass through the Rhine Gorge, could attack France simultaneously if one ascended the Moselle to Luxemburg and the other passed from Cologne westward around the north side of the hilly country to the Meuse and then followed southward up that valley. Hence it was that in the early weeks of the war we heard much of the “army of the Moselle” and the “army of the Meuse”; and the capture of Liège, Huy, Namur, Dinant and Givet marked the progress of the latter army

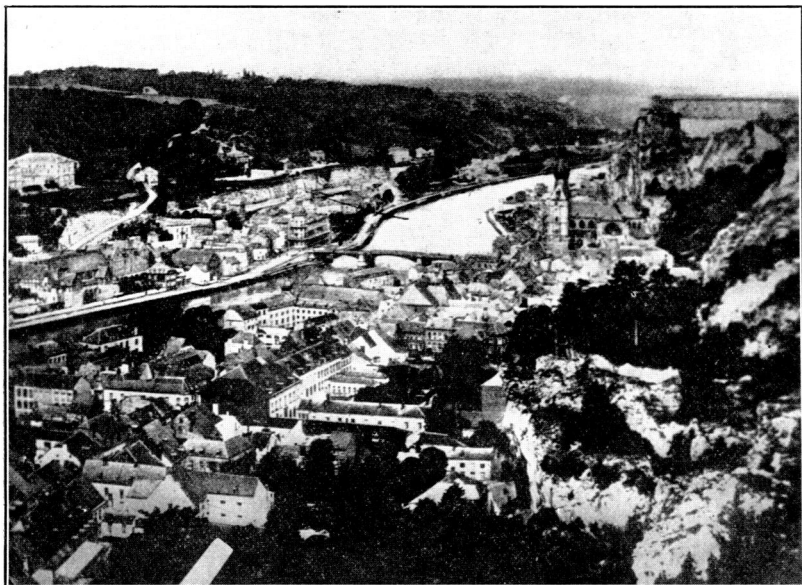


FIG. 3.—Distant view of Dinant, Belgium, showing the even sky-line of the Ardennes upland. The river is the Meuse, whose valley forms one of the two routes by which the Germans crossed through the upland to France.

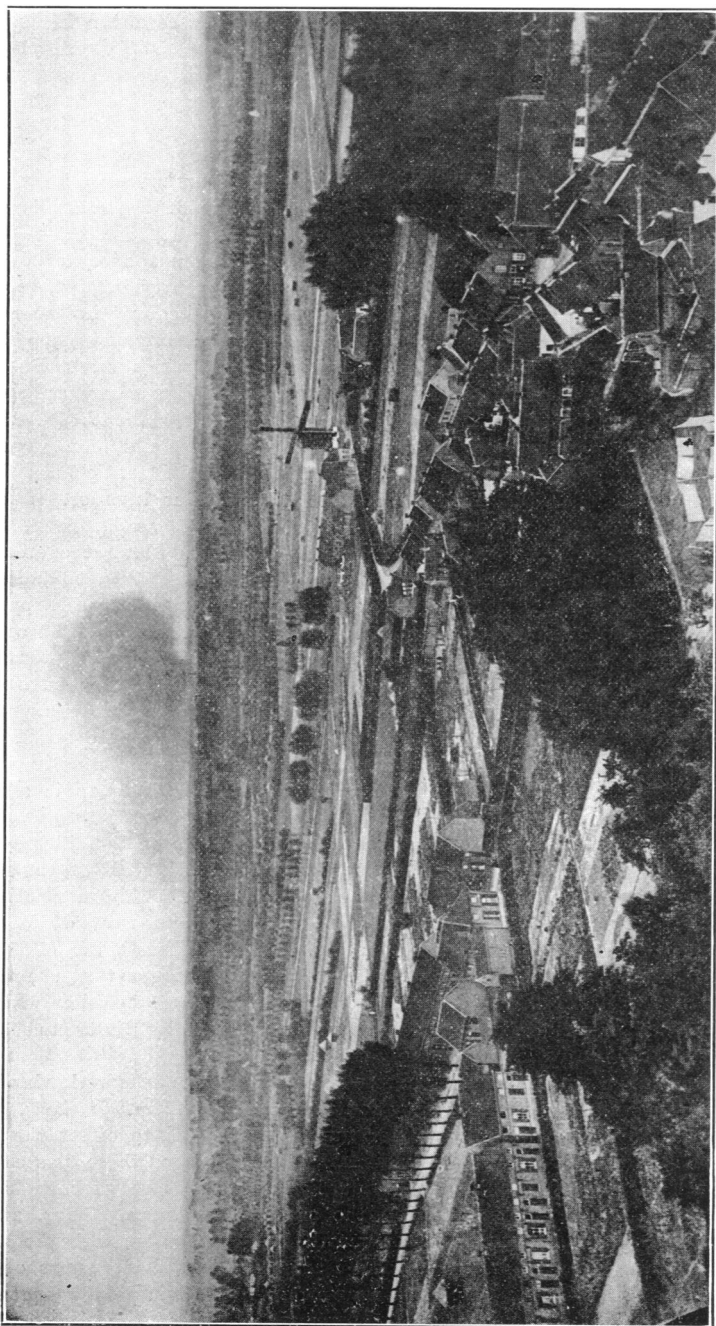
along the best pathway through the Ardennes. The forts guarding the towns just named were located on projecting spurs of the upland, whence they overlooked the closely crowded houses on the narrow valley floor below, or on portions of the upland farther back from the river. Photographs of the fort at Dinant have become familiar to most Americans from their frequent appearance in the pictorial supplements of newspapers and in magazines. The vertical cliffs crowned by solid walls of masonry suggest an inaccessible mountain peak and seem well-nigh impregnable. But such pictures are taken from the valley side of the fort; it must not be forgotten that from a different viewpoint the fort would be seen to rest upon the edge of a fairly level upland and to be more accessible from the upland surface, even though that surface is somewhat dissected by smaller stream courses.

Now, let us return to the inner part of the Basin, where the horizontal stratified rocks still cover the older and complexly folded beds. The rock layers of the stratified series are of unequal hardness, and it will be observed from the diagram that wherever a resistant layer comes to the surface it forms a line of cliffs, while the intervening weaker layers have been eroded into broad valley lowlands. If the basin structure were perfect, the upwarped edges of each resistant layer would form a circular line of cliffs extending all the way around Paris. As it is, the rudely circular arrangement of the cliffs is very noticeable, although they are not everywhere developed.

It will be seen that the cliffs face outward, away from the center of the basin, while from their crests the upland surfaces slope gently inward, toward Paris. It is these uplands which are referred to as "plateaus" in the newspaper despatches. They differ from typical plateaus in having one steep slope and one gentle slope, and are known to geographers as "cuestas." Because the steeper side of the cuesta is always away from Paris, an enemy approaching that city from the east would have to ascend the escarpments under the fire of the defenders' guns, whereas the army of defense could manœuvre its troops to advantage on the upland above, or retire down the gentle back slope while a small rear guard delayed the ascent of a victorious invader. During the Battle of the Marne the German center near Sézanne is said to have been subjected to a disastrous fire from French artillery posted along the crest of the first line of cliffs east of Paris, a position which effectively commanded the open plains of the broad lowland of Chalons just east of the escarpment. For months a German army operating against Verdun from the lowland of the Woëvre district has tried in vain to ascend the line of cliffs east of that important fortified city; and at the time these lines are written they have only succeeded in gaining a precarious foothold further south, where the escarpment is partly broken down by more effective erosion. According to the best available information, the Verdun forts have not been active in repelling the German attacks; but the French field army, aided by the topographic advantage, has held the Germans out of range of the forts.

The only instances in which a cuesta is bordered by cliffs on the side toward Paris occur where a river has eroded a valley in the upland, west of the main cliff-face and parallel to it. Examples of this are found at Verdun where the Meuse River flows through the back slope of a cuesta, and west of Verdun where the upper Aisne River has a similar course. The west-facing cliffs are merely the eastern walls of the river valleys; and it will be seen that the Forêt d'Argonne, where stiff fighting has occurred both in this and in other wars, is a long and comparatively inaccessible tableland formed by that part of a cuesta lying east of the valley of the upper Aisne.

It is true that some rivers cut across the cuestas from one lowland to another, giving a limited number of easy routes through the lines of cliffs. But the openings are neither wide enough nor numerous enough to offset the protective effect of the east-facing escarpments. Furthermore, these passes are easily guarded by fortifications, the individual forts being located both in the valleys and in commanding positions on the adjacent uplands. Thus, at La Fère, Laon, Rheims, and Soissons, which guard the openings through the inner line of cliffs to the Oise River Valley and Paris, the projecting spurs of the upland are crowned by forts whose guns frown down upon each valley gateway from various points of the compass. A large proportion of the places whose



Copyright by American Press Association.

FIG. 4.—Level plain of northern Belgium. Over this remarkably flat surface the Germans moved great armies with almost incredible rapidity. The black smoke in the distance is from the town of Audogen set on fire by Belgian shells.

names filled the news columns during the German advance on Paris and the retreat to the Aisne are strategic points because they guard important openings through the cuesta escarpments. In addition to the four named above, one might mention Épernay, Sézanne, Reims, Vitry-le-François, Nancy, Toul, Verdun and Metz, not to mention others which have figured less prominently in the press reports.

The gap at Toul is not now occupied by any river; but the upper Moselle formerly flowed through this opening into the Meuse River, until it was diverted to its present course. The abandoned valley through the cliffs is of such strategic importance that it is protected by one of the strongest fortifications in France. At Sézanne is another gap abandoned by the stream which carved it; but in this case the capture of the former river by one of its neighbors occurred so long ago that the gap had not been cut to any considerable depth or width; hence this route, although used by an important railway, is not of such great strategic value. A third gap carved by a river which has since been diverted to a new course is found just north of Sézanne; and the St. Gond Marsh, where German artillery became mired during the retreat which followed the successful French attack upon the German center between Sézanne and Vitry, is caused by stagnant water occupying the abandoned valley of the diverted stream.

Toward the northwest the successive lines of cliffs decrease in height and finally disappear. Further north the plain of Holland and northern Belgium, formed in part by the delta deposits of the Rhine and other rivers, reaches the sea at an altitude so low that only dykes prevent its marginal areas from being submerged at high tide. The Belgians have repeatedly taken advantage of this topographic feature, as when they retarded the siege of Antwerp by opening the dykes and flooding the country adjacent to the city, and during the Battle of the Yser, when they flooded the lower part of the Yser Valley and forced a German retreat. Even where the plain is not low enough to be submerged it is remarkably free from topographic inequalities of any magnitude. The river valleys are shallow, and the valley walls slope very gently upward to the level surface of the plain. Good roads and railways are numerous, and the forests have been largely removed in order to devote the fertile land to agriculture. The plain is not only admirably adapted to the rapid movement of great masses of troops, but is productive enough to sustain large armies for a long period. It is a part of the vast lowland extending from southwestern France to northeastern Russia, over which one may travel the entire distance by rail without passing through a single tunnel and without rising 600 feet above the level of the sea. Its remarkably flat surface is the most striking characteristic of landscape views of central and western Belgium.

It is interesting to consider Germany's breach of Belgian neutrality in the light of the topography as described above. A glance at the accompanying diagram will show that four principal routes of invasion were open to her. She could concentrate her forces in the southern part of the broad valley of the middle Rhine and thence ascend the steep eastern face of the Vosges Mountains or pass around their northern end across the dissected upland of Lorraine, or around their southern end through the narrow gateway guarded by the fortifications of Belfort. If these obstructions were successfully passed, the invading armies would then have to scale in succession one line of east-facing cliffs after another, under the fire of artillery directed against them from every projecting spur of the escarpment and from the head of every ravine cut back in

its face. To perfect their lines of communication, the fortresses protecting the openings through the cliffs would have to be levelled as the troops advanced. The engineering problems involved in supplying a large army and in moving heavy siege guns would be far more serious in a country broken by such



Copyright by Underwood & Underwood.

FIG 5—The first line of east-facing escarpments, east of Paris, near Ay. From the summit of these vineyard-covered slopes French artillery dominated the lowland of the Champagne district, during part of the Battle of the Marne.

escarpments than on a level plain where new transportation routes are readily constructed at will. Germany could scarcely hope to make a dashing attack on Paris by this southern route, even were the fortifications here no more

formidable than those farther north. The topography alone would enable the French to render the advance of an invader slow and costly.

An advance up the Moselle by way of Metz would obviate the necessity of crossing the escarpment of the Vosges; and if the army turned southwest through Luxemburg it would avoid still more of the topographic difficulties of eastern France. But, as appears from the diagram, most of the cuesta escarpments would still have to be crossed on the way to Paris, and this route is open to the same objections, although to a lesser degree, as the more southern one.

The two remaining routes lie through Belgium. The one up the Meuse through the Ardennes involves the destruction or masking of the forts on the uplands overlooking the valley at Namur and other points; but once in French territory the cuestas could be crossed where they are dying out toward the northwest, and the march on Paris could be made over a country much easier to traverse than that farther east. Less direct, but still more favorable for the movement of armies, is the route across the level plains farther north in Belgium, by way of Louvain, Brussels and Mons into the slightly dissected plain of northern France near Cambrai and St. Quentin. Here an army could avoid every important topographic obstacle until the broad valley of the Seine was reached. Even if the taking of La Fère and Laon were necessary, these fortifications mark the innermost cliff line next to Paris and are located where that escarpment is dying out toward the northwest to disappear entirely.

It is highly significant that the main invasion of France was by the most roundabout but topographically most favorable route. The distance from the nearest point on the Franco-German boundary, near Metz, to Paris is about 170 miles as the aeroplane flies. From the German-Belgian border to Paris via the Belgian plain the distance is approximately 250 miles. Germany therefore selected a route which was nearly 50 per cent. longer than that directly from her own territory into France. The longer route involved the violation of Belgian neutrality, and to follow it would very probably bring into the conflict the Belgian army, and possibly the army and navy of Great Britain. Surely the choice of an invasion through Belgium must have been dictated by very compelling reasons to justify it in the minds of the German general staff. The official statement that the crossing of Belgian territory was "a matter of life and death" to Germany was literally true. An advance from the Franco-German boundary across the cuestas of the Paris Basin would undoubtedly have required the sacrifice of an added number of German lives, and would have made impossible the contemplated rapid dash to Paris.

Germany was compelled to choose between keeping her international pledges at the expense of crossing unfavorable topography and breaking those pledges in order to profit by a more favorable route. She chose the latter course. Without touching on the ethical questions involved, we may note that for political reasons the violation of Belgian neutrality has undoubtedly proved more costly than would have been the crossing of the escarpments of north-eastern France.

(Other parts will follow.)